

# McCraw and Arnold's Atlas of Muscle and Musculocutaneous Flaps



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Global-HELP  
Publication

# VASTUS LATERALIS

## ANATOMICAL CONSIDERATIONS

### *Surface Markings*

The contracted vastus lateralis muscle can be palpated between the lateral margins of the rectus femoris and biceps femoris muscles. The cleft between the biceps femoris and vastus lateralis muscles is easily visualized in most legs. The anterior margin of the vastus lateralis muscle can best be palpated at the lateral border of the rectus femoris muscle in the lower thigh.

### *Origin and Insertion*

Anteriorly the vastus lateralis originates from the lateral surface of the greater trochanter and the trochanteric line of the femur. Posteriorly it originates from the lateral lip of the linea aspera and the intermuscular septum. It inserts into the tendon of the rectus femoris, the upper border of the patella, and the lateral condyle of the tibia, thereby forming a part of the lateral patellar retinaculum. The vastus lateralis muscle functions as an accessory knee extensor and lateral knee stabilizer. It is functionally expendable if the rectus femoris and tensor muscles are intact.

### *Adjacent Muscles*

The vastus lateralis muscle lies between the rectus femoris and biceps femoris muscles and encompasses the whole of the lateral thigh. The vastus intermedius muscle surrounds the femur and lies deep to the vastus lateralis muscle throughout its course. The overlying tensor fascia provides a "sausage casing" which is loosely adherent to the surface of the vastus lateralis muscle.

### *Vascular Pattern*

The proximal vastus lateralis muscle is supplied by the lateral circumflex femoral artery, a branch of the profunda femoris artery. Branches of the same vessel also supply the tensor and rectus femoris muscles. The majority of the vastus lateralis muscle is nourished by this proximal vasculature, but the distal one-third of the muscle is independently supplied by deep perforating branches of the superficial femoral vessels. Although it may be possible to carry the entire muscle on the proximal vessels, only the proximal two-thirds of the muscle can be reliably carried by the lateral circumflex femoral system. Like other broad, flat muscles, the extensive intramuscular vascular network will support either a distally based or a proximally based muscle flap.

### *Motor Nerve*

Femoral nerve

## USES

The primary use of the vastus lateralis muscle is in situations which require muscle coverage, rather than skin or fascial replacement. The arc of rotation is almost identical to the TFL flap and includes the ischium, the greater trochanter, the hip, the groin, and the lower abdomen. The tensor fascia can also be "carried" on the surface of the vastus lateralis muscle in order to provide a supplemental "living" fascial replacement for the abdominal wall. As a practical matter, the vastus lateralis muscle flap is seldom used for abdominal wall replacement because it is more difficult to elevate than either the rectus femoris or TFL flaps. It does provide an unparalleled volume of muscular tissue for deep defects of the hip, femur, and groin.

## REGIONAL FLAP COMPARISONS

The vastus lateralis muscle flap is primarily used to introduce a large amount of muscle into areas of low-grade infection or irradiation damage. Enthusiasm for the use of this large muscle flap has been tempered only by the bloody dissection which is necessary for its retrieval. When the biceps femoris V-Y flap is unavailable, the vastus lateralis muscle flap is useful for the obliteration of an ischiectomy defect. Like the smaller rectus femoris muscle flap, the "island" vastus lateralis muscle flap will reach the iliac crest and the hip joint. The more accessible rectus femoris muscle flap is usually chosen for these adjacent defects when it is thought to be large enough to correct the deformity. When combined with the vastus medialis muscle flap, the vastus lateralis muscle flap can simultaneously be used to restore knee function and resurface the distal anterior thigh. The vastus lateralis muscle and the TFL flap have nearly identical arcs of rotation, but the TFL flap is much more easily manipulated. Even though the vastus lateralis muscle can be used to reconstruct the abdominal wall, it is more reasonable to use the rectus femoris muscle flap for the lower abdomen and use the "island" tensor myofascial flap for the upper abdomen.

## DISADVANTAGES

Only the proximal two-thirds of the muscle can be carried reliably by the proximal pedicle because the distal one-third of the muscle is supplied by segmental branches of the superficial femoral vessels. This is not so much a disadvantage as it is a recognized reality of the existing

blood supply. Still, it can be a cause of distal muscle flap necrosis. The vastus lateralis muscle has a dense fascial layer on both its superficial and deep surfaces, but it is not as strong as the fascia included with the TFL or rectus femoris flaps. Like the TFL flap, the donor site is subject to prolonged drainage. The dissection of this muscle is much more tedious and bloody than the dissection of either the rectus femoris or TFL flaps because it is difficult to define the distal limits of the muscle. Although it is possible to injure the proximal vascular leash, it is easily visualized and reasonably predictable in its location. If these proximal vessels are accidentally divided there is no secondary blood supply to fall back on. In this event, the proximally based flap will be totally lost.

## ADVANTAGES

The vastus lateralis muscle can be completely removed through a single incision with a primary closure of the donor site. There is no noticeable depression in the area of its removal, and we have not noticed any functional loss from its use. It is certainly expendable when the adjacent thigh muscles are intact. The vastus lateralis muscle is quite broad (fifteen centimeters wide) and provides an excellent new blood supply for its expected areas of coverage. A skin graft on the surface of the transposed muscle offers a very acceptable esthetic result, and neither muscle bulk nor lymphedema have marred the eventual results in our cases. The vastus lateralis muscle can also be raised as a myocutaneous flap since there are numerous cutaneous perforators in the distal half of the muscle which pass directly to the skin. This vastus lateralis myocutaneous flap offers a mechanism to transpose the distal thigh skin to a remote site, but the skin-grafted donor site is usually less desirable than a skin-grafted muscle flap. It can also be used as a distally based "salvage" flap for the anterior knee because of the independent superficial femoral vasculature.

## COMPLICATIONS, PITFALLS, AND DONOR SITE

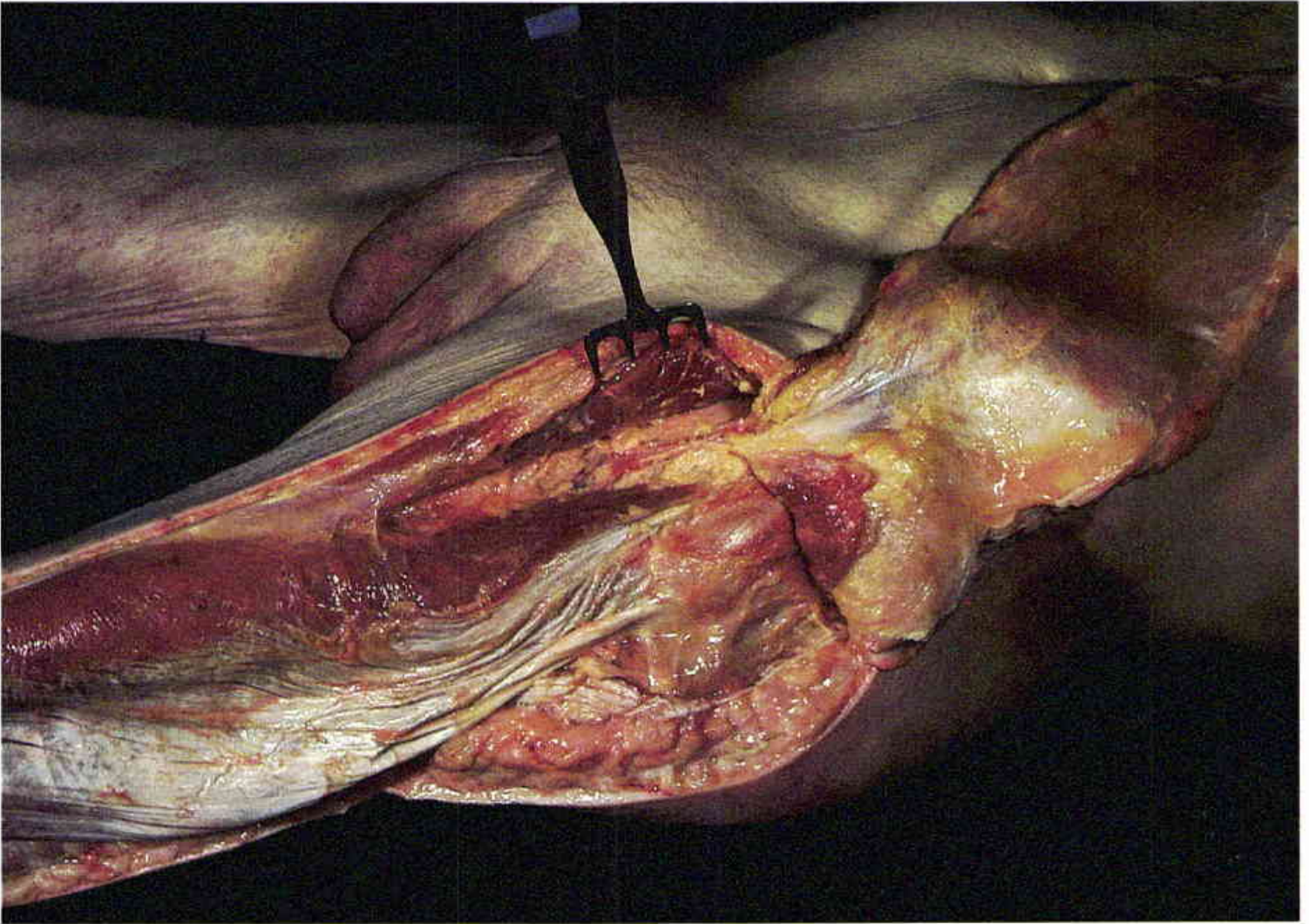
Some loss of part of the distal one-third of the muscle can be expected if an attempt is made to carry the entire muscle on the proximal vasculature. Torsion on the proximal vessels has been the apparent cause of partial flap necrosis. If our experience with other muscle flaps can be translated to this flap, external compression should also be expected to be a potential cause of flap necrosis.

Clearly, there are several recognized pitfalls in the elevation of this muscle flap. The proper sequential dissection of the muscle is crucial to the success of the

flap transfer. First, the vastus lateralis muscle should be identified at the lateral margin of the rectus femoris tendon and the distal tendons of these muscles should be carefully separated. Once this is done, the plane between the vastus intermedius and vastus lateralis muscles becomes readily apparent. The dominant vascular leash can then be isolated by retracting the proximal belly of the rectus femoris muscle. The remaining dissection of the distal thigh is bloody and imprecise because the distal vastus lateralis muscle is fused with both the vastus intermedius and the biceps femoris muscles. Rather than attempting to identify these three fused muscles in the distal thigh, it is preferable to divide the vastus lateralis muscle above this area of muscular fusion. If these surgical steps are not taken sequentially, one can injure the proximal vessels or incorrectly define the limits of the vastus lateralis muscle. Special attention should also be given to the femoral nerve since it is the sole motor nerve for the anterior thigh musculature. The femoral nerve is intimately related to the lateral circumflex femoral vessels but it is easily identified on the surface of the vastus intermedius muscle in the femoral triangle.

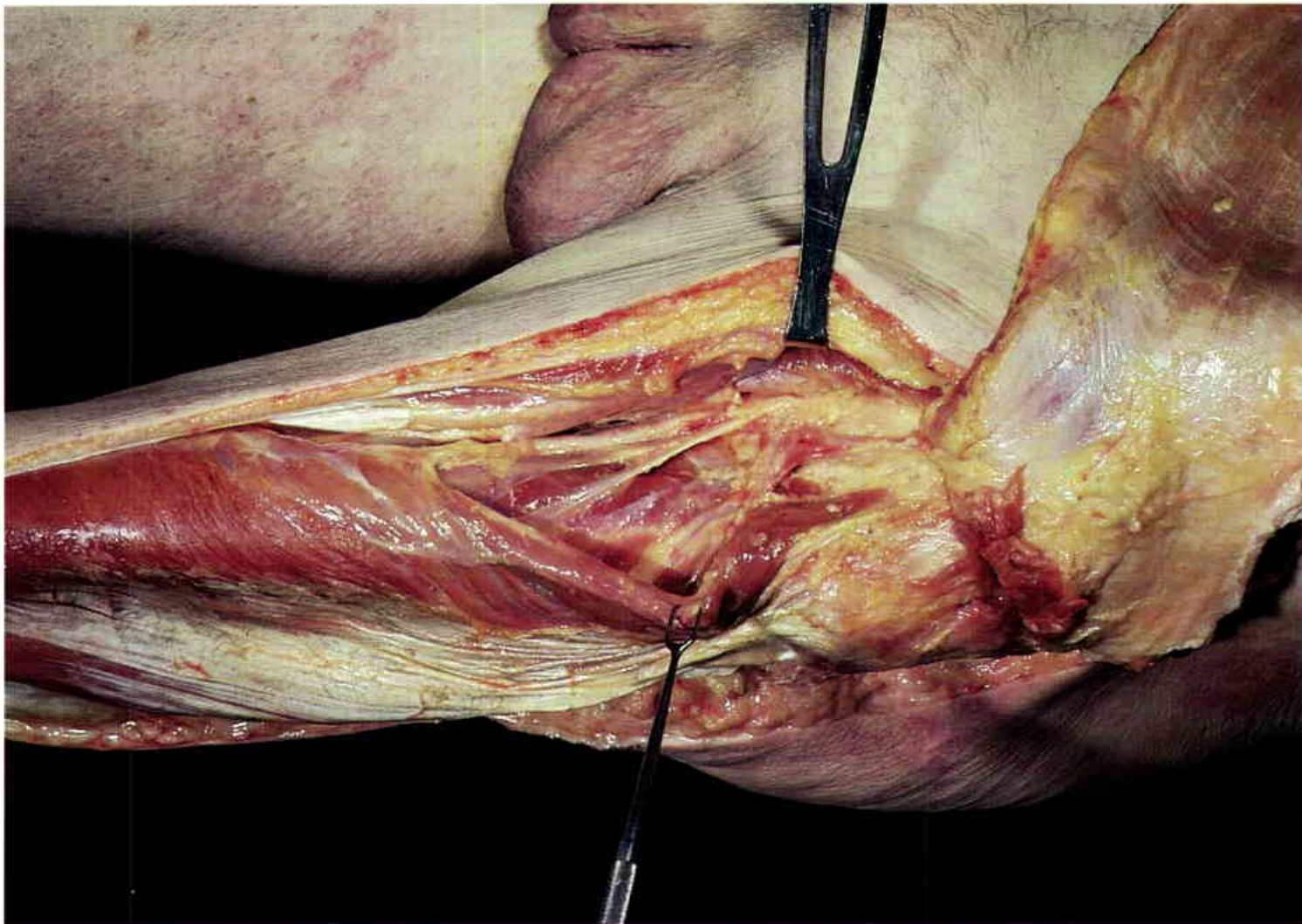
Unless a TFL flap is used in combination with the vastus lateralis muscle flap, the donor site can be primarily closed. Prolonged serous drainage from the donor site, as in the case of the TFL flap, occasionally occurs. Overall, the donor site is favorable and presents very few problems.





**1**

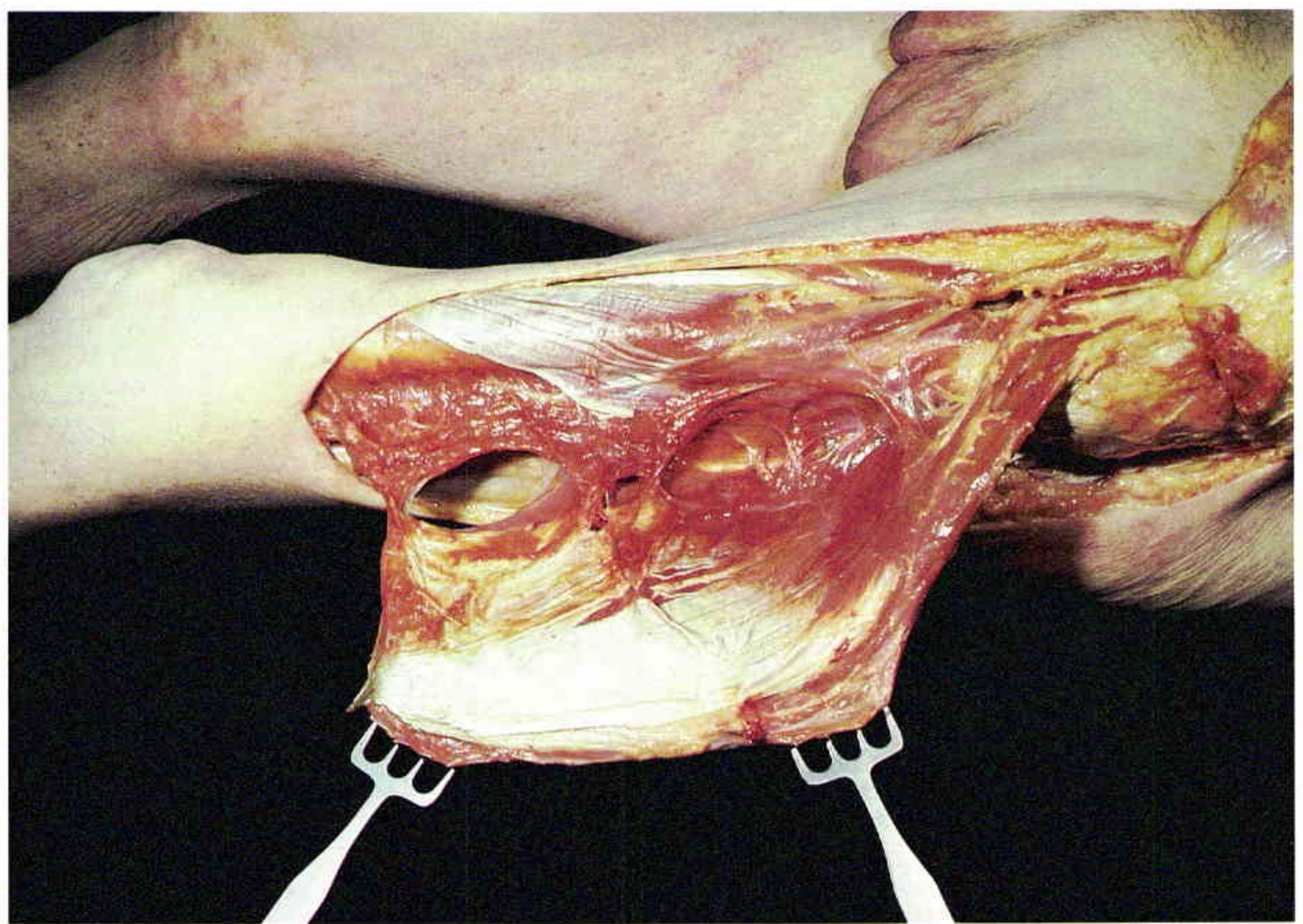
The overlying TFL flap is elevated for illustrative purposes. The proximal vasculature is first identified by separating the (retracted) rectus femoris muscle from the vastus lateralis muscle. Note the dense fascial attachments of the vastus lateralis muscle to the greater trochanter and the upper femur.



2

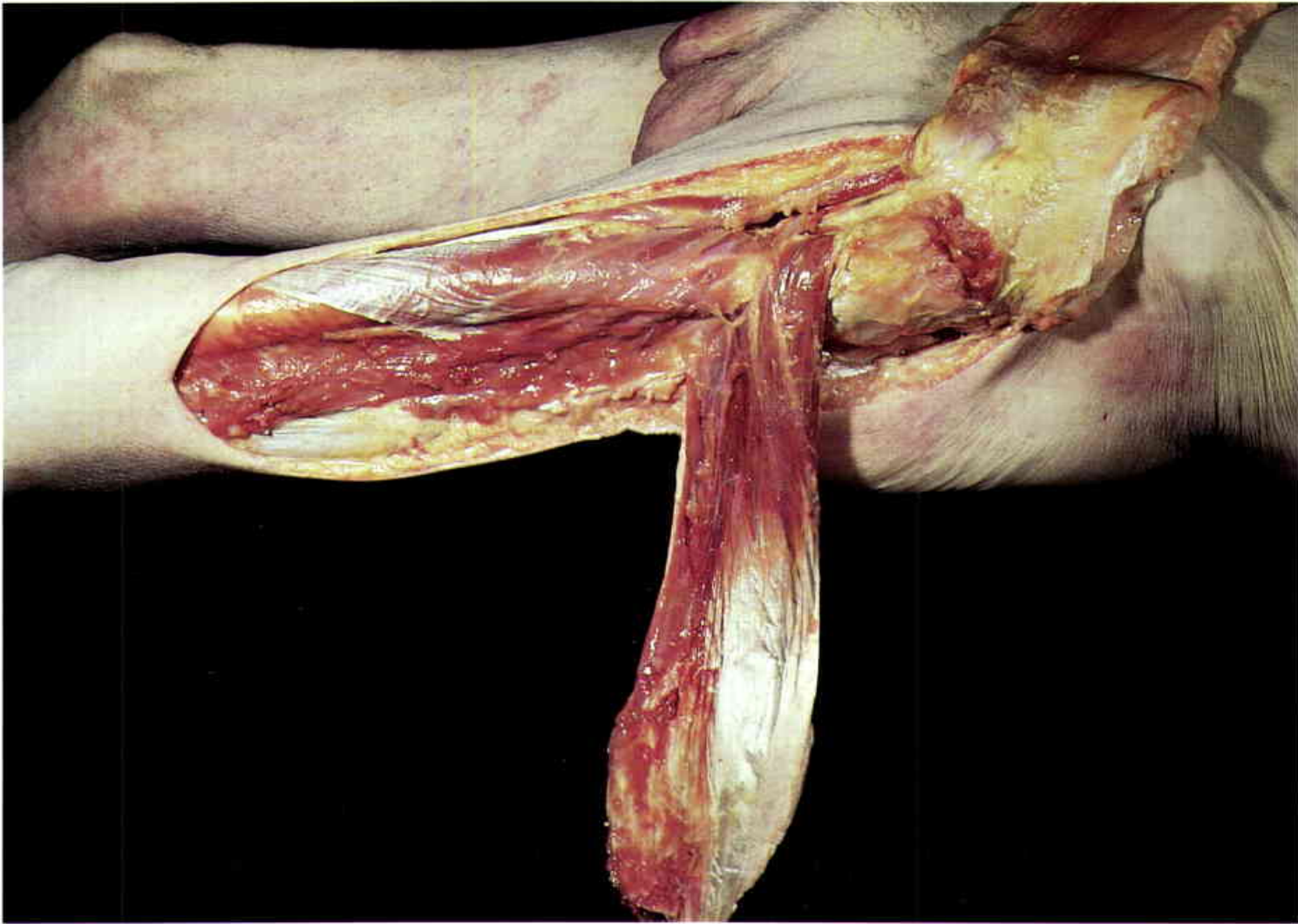
The dominant vessels enter the under surface of the vastus lateralis muscle after passing beneath the rectus femoris muscle. The neurovascular bundle is seen between the two retractors. Note the femoral nerve on the surface of the vastus intermedius muscle.





3

The vastus lateralis muscle is elevated away from the vastus intermedius muscle. The two muscles are still attached by numerous deep muscular perforators. Note the dense fascia on the undersurface of vastus lateralis muscle.

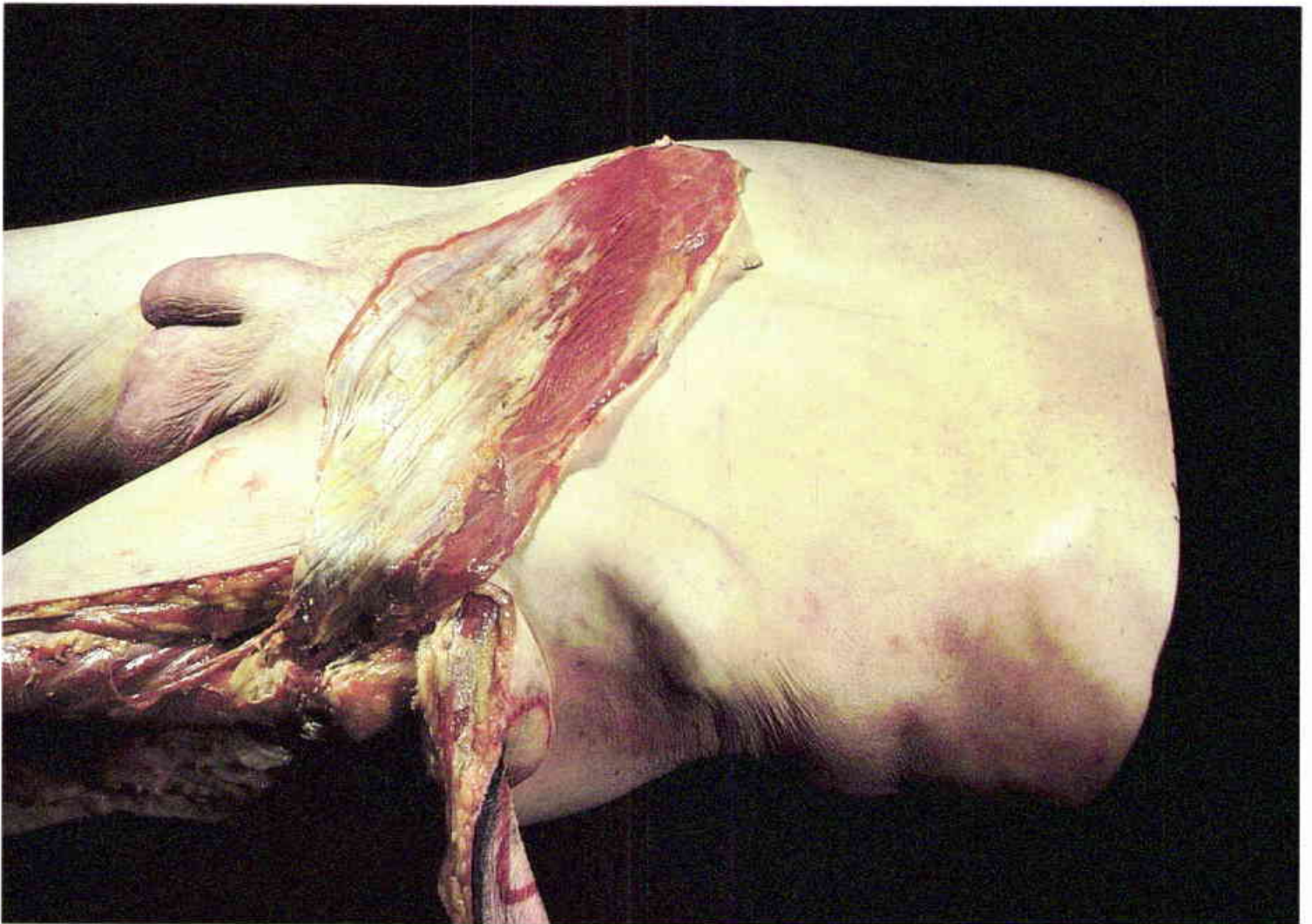


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**4**

The vastus lateralis muscle is elevated away from the biceps femoris and vastus intermedius muscles. The extensive upper femoral origin is still intact. The dominant vessels are seen on the undersurface of the muscle after they circle the proximal femur.

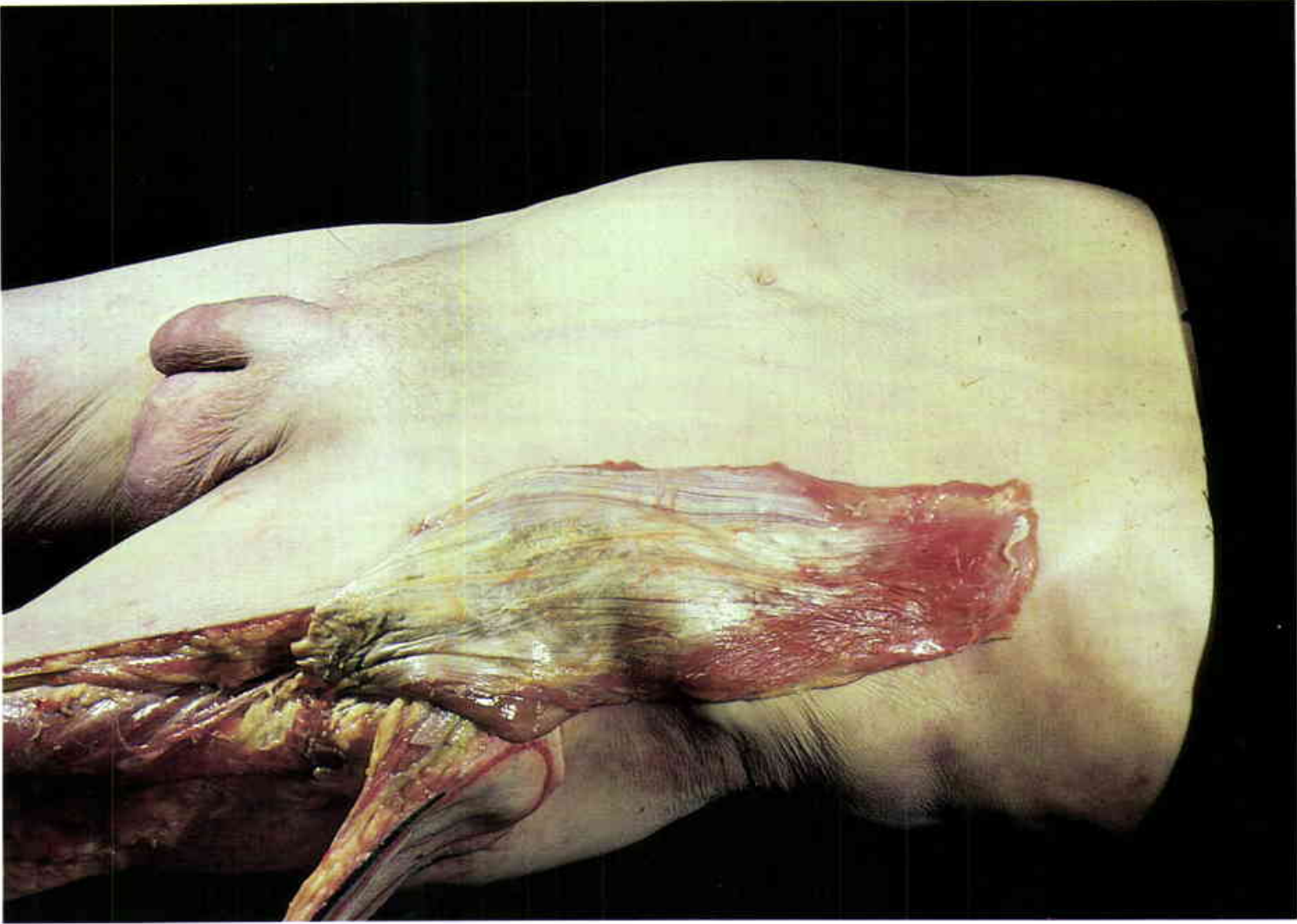




5

Upward mobility of the "island" vastus lateralis muscle flap after the muscular origin has been divided. The deep muscular fascia is visible on the surface of the vastus lateralis muscle. The anterior arc of the flap includes the groin, the middle abdomen, and the hip joint.





6

The muscle flap will barely reach the lower chest wall, but it easily covers the entire iliac crest. The fifteen centimeter width of the vastus lateralis muscle is remarkable.



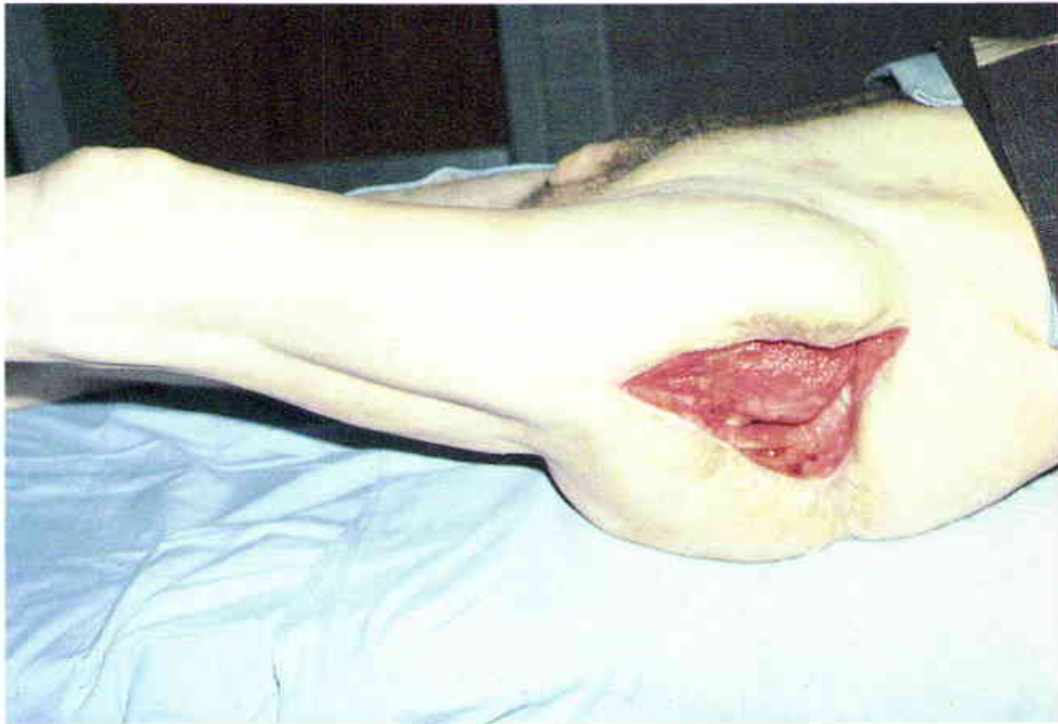
7

Rotation of the flap onto the posterior iliac crest. The vastus lateralis muscle flap cannot be extended onto the sacrum.



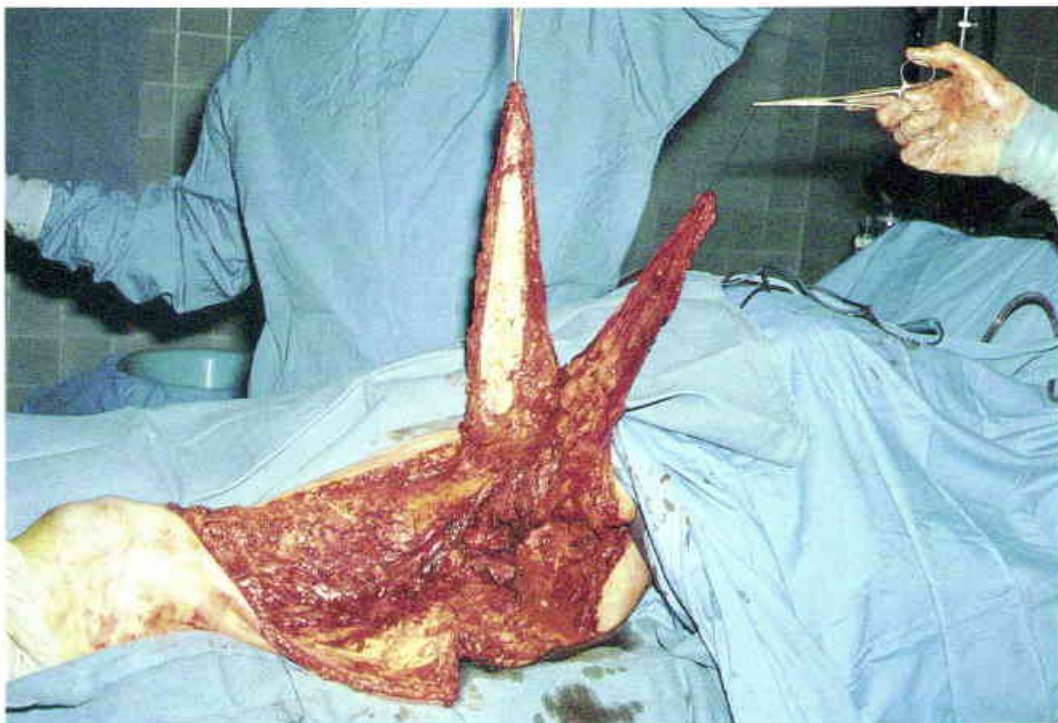


8  
Posterior rotation of the flap into the area of the ischial tuberosity. Although the flap dissection is tedious, a significant volume of muscle can be transposed into a hip defect or an ischial cavity.



9

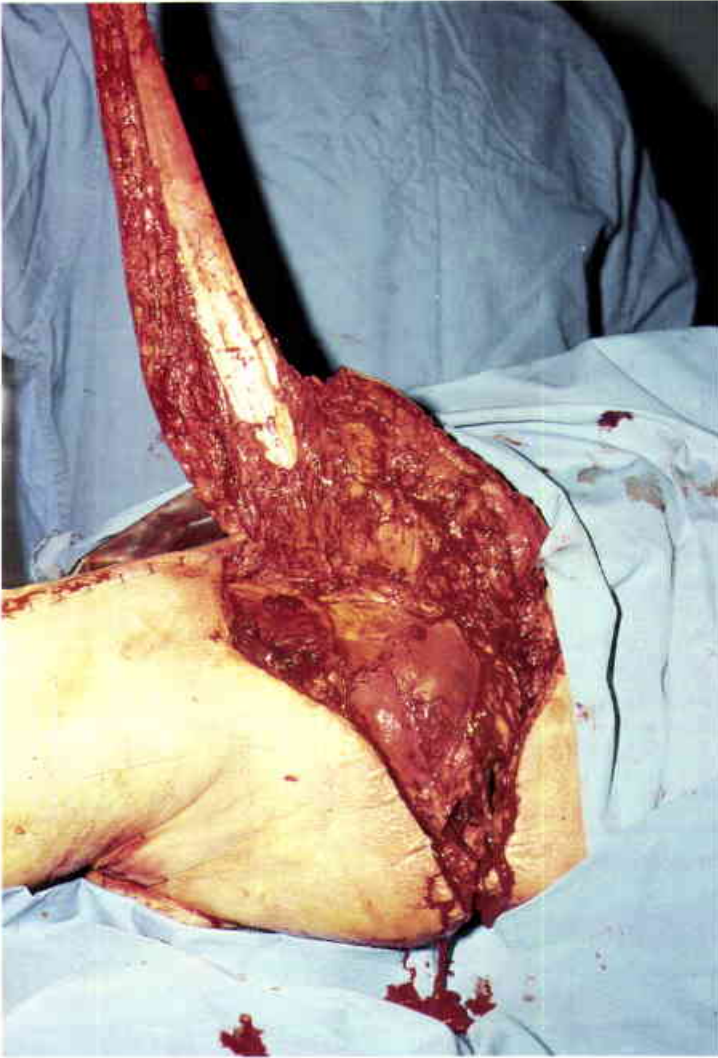
Massive hip defect following the removal of a total hip prosthesis. Both the proximal femur and the acetabulum were grossly infected. (Case of P.G. Arnold)



10

Lateral view of the thigh, which has been exposed through a midlateral incision. The vastus lateralis muscle is retracted with a suture. The rectus femoris muscle is retracted with forceps.





11

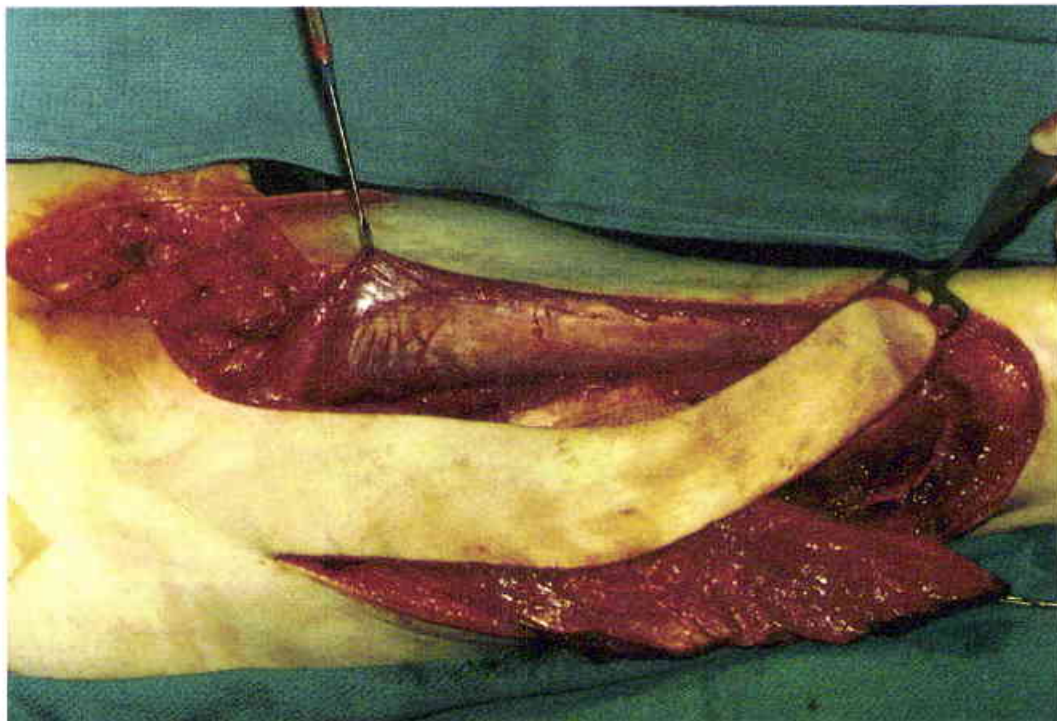
The vastus lateralis muscle has been transposed into the infected hip cavity. The retracted rectus femoris muscle will be used to obliterate the remaining surface defect.



12

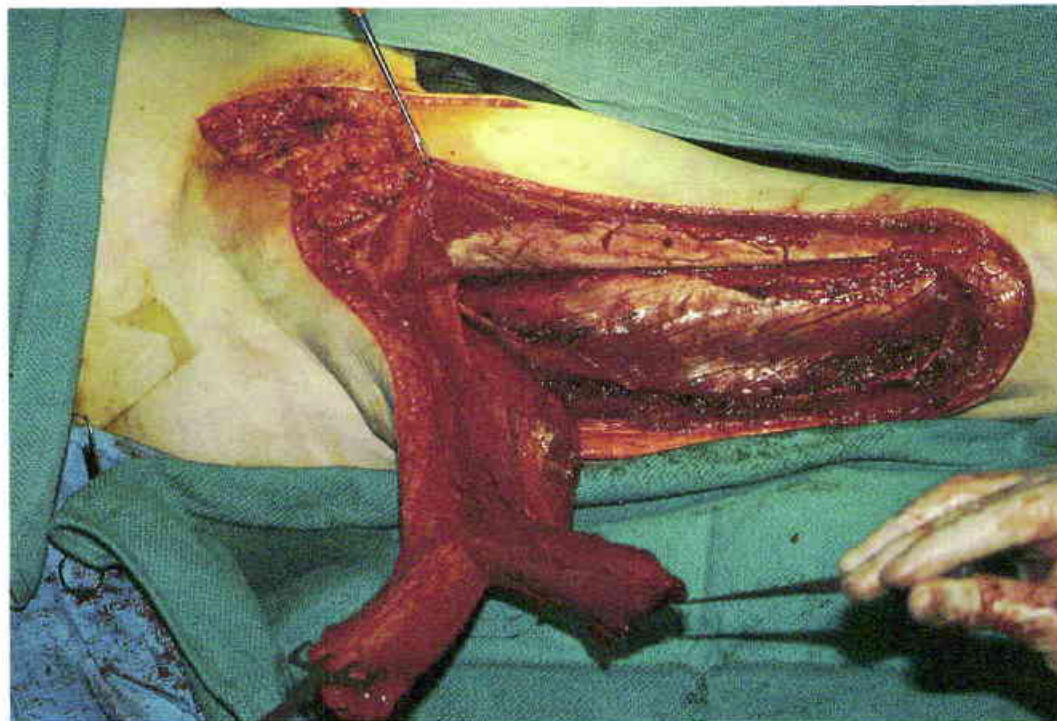
“Random” skin rotation flaps were used to provide surface coverage for the transposed muscle flaps. Note the healed donor site incision in the anterolateral thigh.

The patient is ambulatory, and the recalcitrant osteomyelitis has not recurred over a period of six years.



13

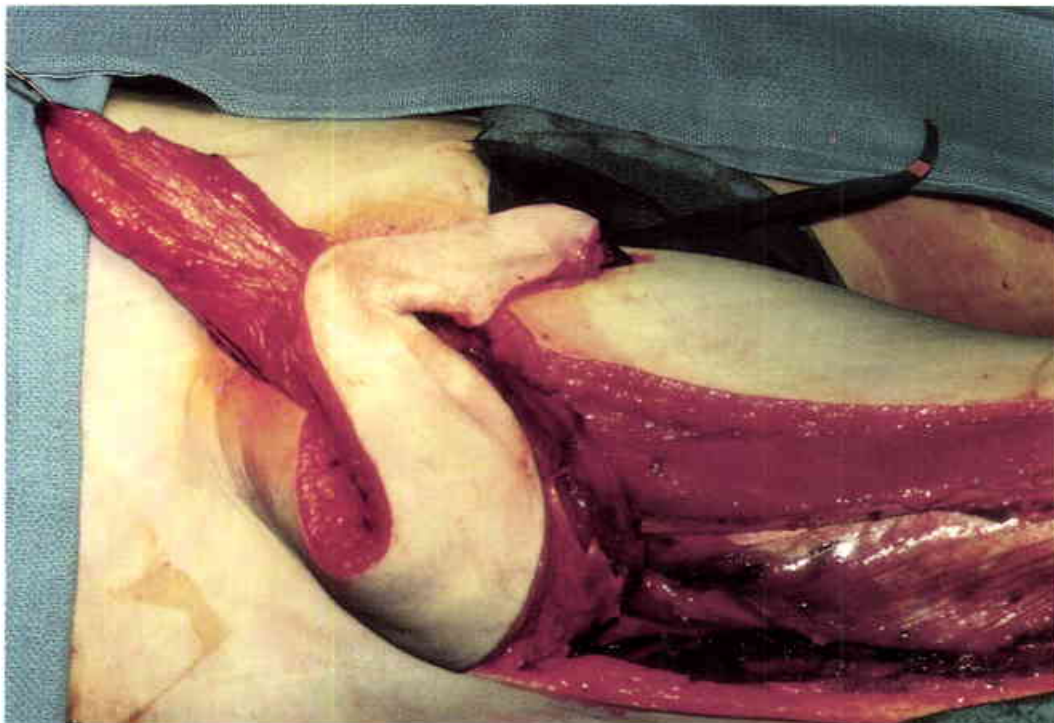
Fifty-eight-year-old patient with an infected Dacron® vascular graft in the groin. A vastus lateralis muscle flap and a TFL flap are elevated in combination. The rectus femoris muscle is retracted with the double hook. (Case of J.B. McCraw and R.T. Gregory, Jr.)



14

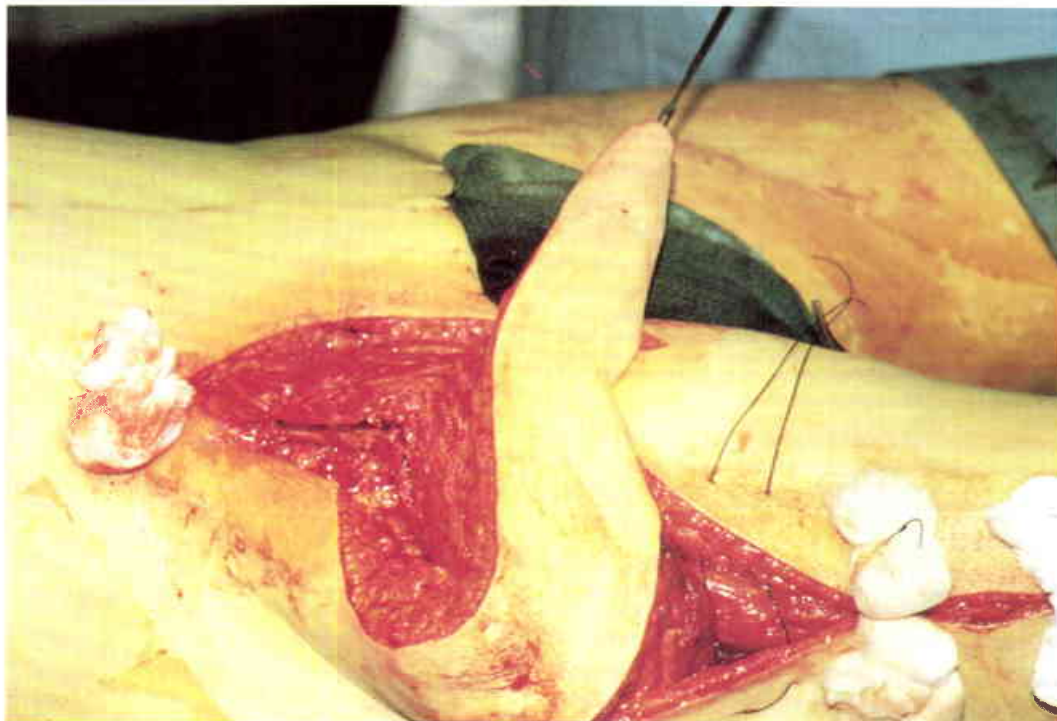
The combined flap has been elevated away from the rectus femoris, vastus intermedius, and biceps femoris muscles. Note the 'hamburger' appearance of the remaining distal vastus intermedius muscle. The groin defect is seen above the retracted rectus femoris muscle.





15

The vastus lateralis muscle is readied for passage beneath the inguinal ligament to cover both the superficial femoral and common femoral vessels. The associated TFL flap will be used for surface cover of the groin skin defect.



16

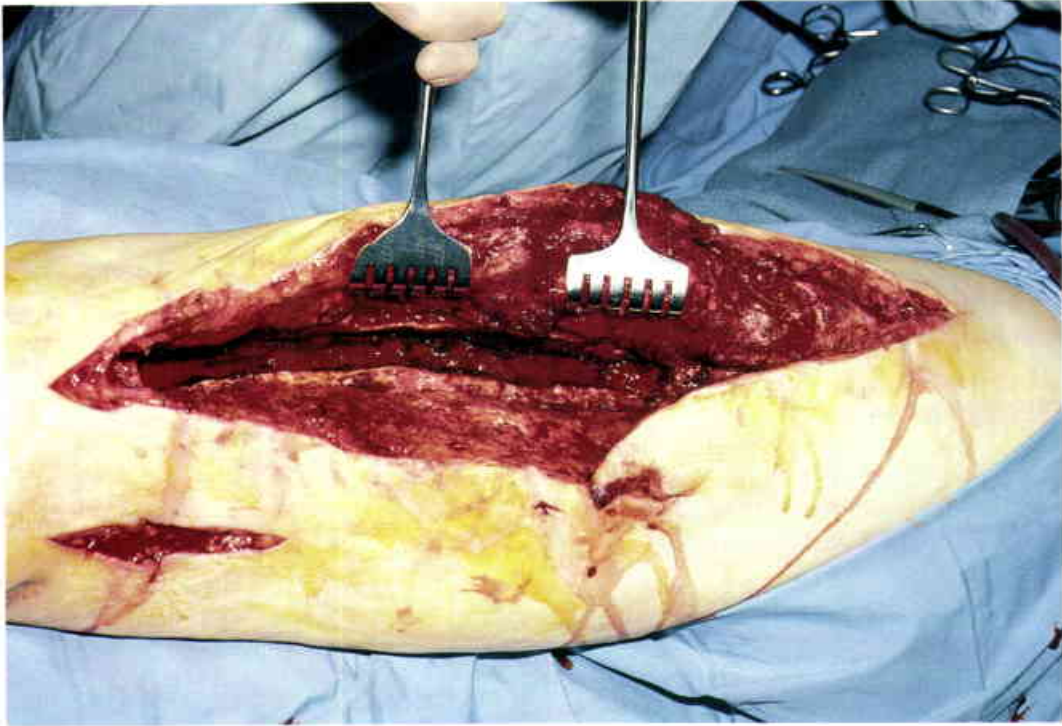
Inset of the vastus lateralis muscle into the groin defect in an "L" shape. The muscle was passed beneath the inguinal ligament to also cover the common femoral vessels.



17

Healed TFL flap on the surface. The vastus lateralis muscle salvaged the infected Dacron® graft. A skin-grafted vastus lateralis muscle flap would have provided a simpler solution with a more esthetic result. The combined TFL flap seemed like a good idea at the time.



**18**

Extensive osteomyelitis of the femur in a twenty-two-year-old male. The majority of the femoral cortex was destroyed by the infection. (Case of P.G. Arnold)

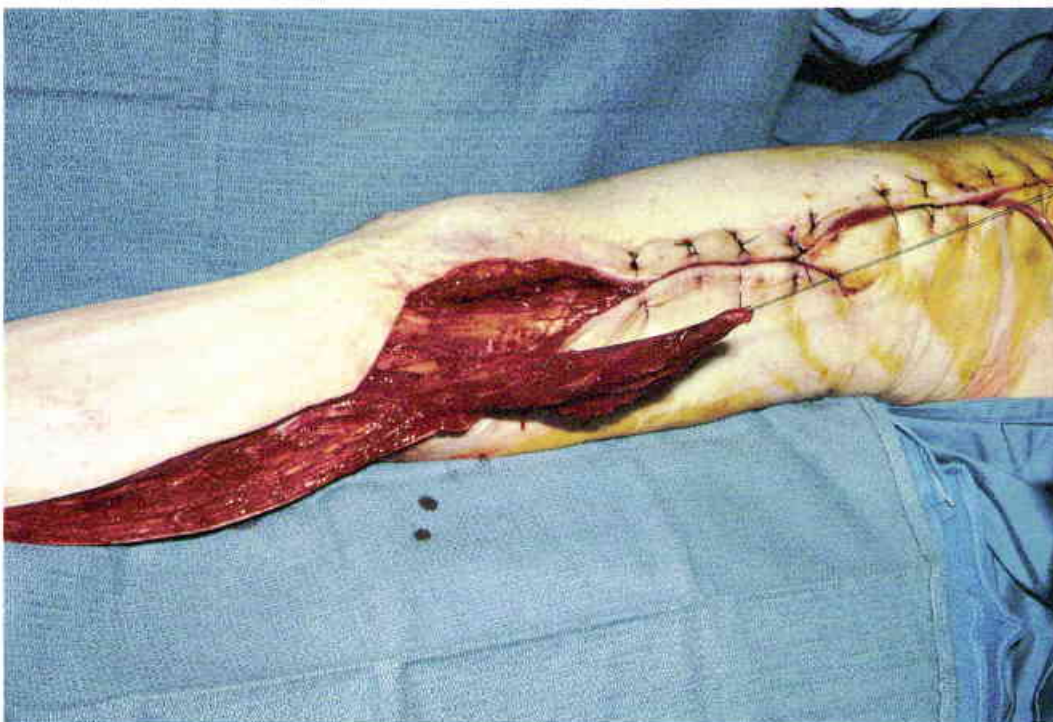
**19**

The vastus lateralis muscle is elevated above the debrided femur. The muscle flap will be used to obliterate the adjacent femoral cavity.



20

The distal femoral bony defect extended beyond the viable limits of the vastus lateralis muscle flap. A second muscle flap was needed.



21

The lateral head of the gastrocnemius muscle was rotated into the remaining distal femoral defect and skin grafted.





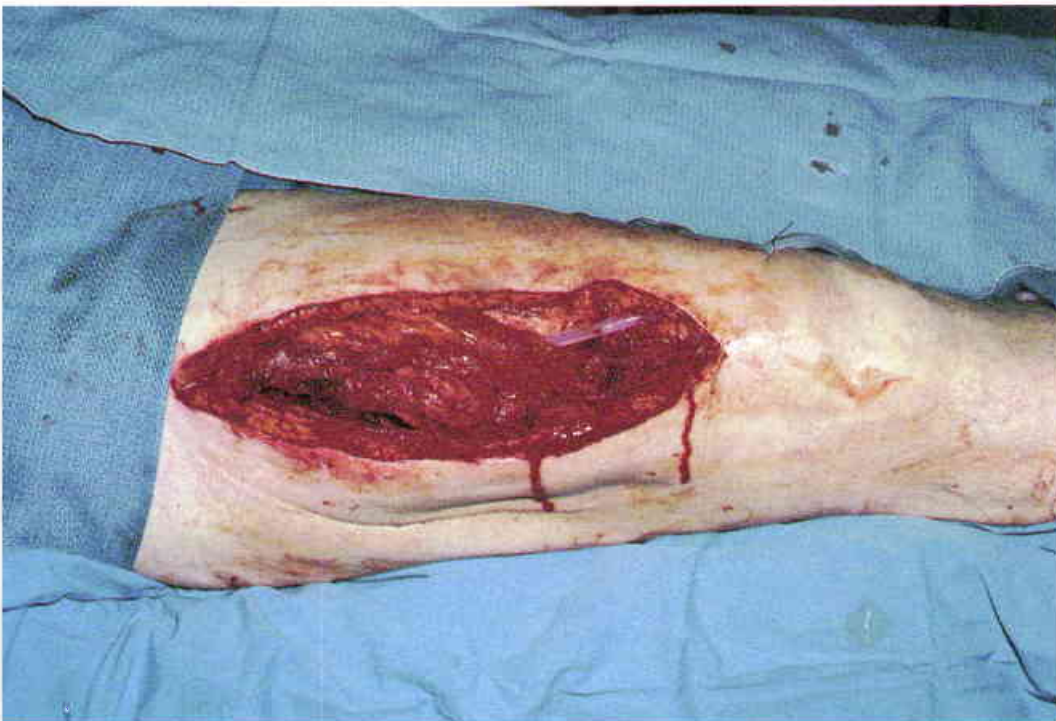
22

The patient is ambulatory, and the osteomyelitis has not recurred over a six-year period.



23

Sixty-five-year-old man with an osteomyelitic cavity of the midfemur following the removal of a metallic plate. The elevated vastus lateralis muscle is "split" to accommodate the defect. (Case of P.G. Arnold)



24

The "split" vastus lateralis muscle was used to obliterate both the femoral cavity and the overlying dead space.





25

Direct skin closure over the muscle flap. Surface sutures of #2 nylon were used as a way of avoiding buried sutures. The wound has remained healed for five years.

## VASTUS LATERALIS

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